CLAIMS

What is claimed is:

1. A method for manufacturing an exhaust emission control device comprising:

disposing a mat support and a substrate in a shell, wherein the mat support is disposed between the substrate and the shell, and wherein the shell has a roughened surface in physical contact with the mat support.

2. The method recited in Claim 1, further comprising forming the roughened surface by coating at least a portion of an inner surface of the shell with a material having a plurality of rough edges.

3. The method recited in Claim 2, wherein the material selected from a group consisting of ferrous materials, and mixtures comprising at least one ferrous material.

4. The method recited in Claim 2, further comprising plasma spraying.

5. The method recited in Claim 1, further comprising forming the roughened surface by a method selected from a group consisting of air blasting, classic machining, extrusion technique, rolling a sheet of shell material between rollers, wherein one or both rollers has grooves or punches, striking a die surface that has protrusions to form opposing shapes in the shell material, forming an oxide coating, spraying with molten metal, acid etching, electro-plating, impacting the shell with objects, securing a second material comprising voids and/or protrusions to the shell, and combinations comprising at least one of the foregoing methods.

6. The method recited in Claim 1, further comprising forming the substrate with a roughened outer substrate surface.

7. The method recited in Claim 6, further comprising roughening an outer substrate surface by a method selected from a group consisting of air blasting, machining, coating, extrusion technique, and a combination comprising at least one of the foregoing methods.

8. The method recited in Claim 7, wherein the roughening further comprises using a wire brush or a cutting tool.

9. The method recited in Claim 7, wherein the roughening of the outer surface further comprises embedding a material in the outer substrate surface.

10. The method recited in Claim 9, wherein the material comprises a plurality of rough edges, and wherein the material is selected from the group consisting of mullite, silica, pulverized scrap substrate material, calcined/boehmite, alumina, and mixtures comprising at least one of the foregoing materials.

11. The method recited in Claim 7, further comprising embedding a material in or on at least a portion of an inner surface of the shell.

12. The method recited in Claim 11, wherein the material comprises a plurality of rough edges, and wherein the material is selected from the group consisting of ferrous materials and mixtures comprising at least one ferrous material.

13. The method recited in Claim 7, further comprising machining substantially all of the inner surface.

14. The method recited in Claim 1, further comprising wrapping the mat support around at least a portion of the substrate to form a wrapped substrate, wrapping at least a portion of the wrapped substrate with porous metal to form a metal wrap, and stuffing the metal wrap in the shell.

15. The method recited in Claim 14, further comprising adhering the porous metal to the shell.

16. The method recited in Claim 1, wherein the roughened surface is a portion of an inner surface of the shell disposed adjacent to the mat support.

17. The method recited in Claim 1, further comprising embedding a material in or on at least a portion of an inner surface of the shell.

18. The method recited in Claim 17, wherein the material comprises a plurality of rough edges, and wherein the material is selected from the group consisting of ferrous materials and mixtures comprising at least one ferrous material.

19. The method recited in Claim 1, further comprising machining at least a portion of an inner surface of the substrate to form the roughened surface.

20. The method recited in Claim 1, wherein the roughened surface has a R_t of about 25 μm to about 3,000 μm.

21. The method recited in Claim 20, wherein the R_t is about 50 μm to about 1,500 μm.

22. The method recited in Claim 21, wherein the R_t is about 100 μm to about 1,000 μm.

23. The method recited in Claim 1, further comprising roughening at least a portion of an inner surface of the shell, wherein the roughening is accomplished with a method selected from the group consisting of rolling with at least one roller comprising grooves or punches, striking the inner surface with a die surface that has protrusions or cavities, heat treated the inner surface to form an oxide coating, spraying with molten metal, acid etching, electro-plating with a rough surface; impacting the inner surface with objects at sufficient velocity to locally deform the inner surface, securing a second material with voids or protrusions to the inner surface, and combinations comprising at least one of the foregoing methods.

24. An exhaust emissions control device, comprising:

a shell;

a substrate disposed within the shell; and

a mat support disposed between the substrate and the shell, wherein the shell has a roughened inner surface in physical contact with the mat support.

25. The exhaust emissions control device recited in Claim 24, wherein an outer surface of the substrate comprises a coating that increases the coefficient of friction between the outer surface and the mat support.

26. The exhaust emissions control device recited in Claim 24, wherein the inner surface comprises a coating that increases the coefficient of friction between the inner surface and the mat support.

27. The exhaust emissions control device recited in Claim 24, further comprising a sheet of expanded metal disposed between the shell and the mat support and attached to the shell.

28. The exhaust emissions control device recited in Claim 24, wherein the roughened surface has a R_t of about 25μm to about 3,000μm.

29. The exhaust emissions control device recited in Claim 28, wherein the R_t is about 50μm to about 1,500μm.

30. The exhaust emissions control device recited in Claim 29, wherein the R_t is about 100μm to about 1,000μm.

31. The exhaust emissions control device recited in Claim 24, wherein the roughened surface is a portion of an inner surface of the shell disposed adjacent to the mat support.

32. An exhaust emissions control device, comprising:

a shell;

a substrate disposed within the shell; and

a mat support disposed between the substrate and the shell, wherein the mat support comprises a porous metal.

33. The exhaust emissions control device recited in Claim 32, wherein the shell further comprises a roughened inner surface.

34. The exhaust emissions control device recited in Claim 33, wherein the roughened inner surface comprises a portion of the mat support adhered to the shell.